I claim:

1. A process for dewatering a slurry of fine particulate material, which comprises the steps of

   i) rendering the particulate material moderately hydrophobic using appropriate means,

   ii) adding a nonionic surfactant of low hydrophile-lipophile balance (HLB) number dissolved in an appropriate solvent or mixtures of solvents,

   iii) agitating the slurry to allow for the surfactant molecules to adsorb on the surface of the moderately hydrophobic particulate material so that its hydrophobicity is substantially enhanced, and then

   iv) subjecting the conditioned slurry containing the particulate material, whose water contact angle has now been greatly increased, to a suitable mechanical method of dewatering,

   so that the moisture of the particulate material is greatly reduced.

2. The process of claim 1 wherein the fine particulate material is smaller than 2 mm in diameter.

3. The process of claim 1 wherein the nonionic surfactant has its HLB number less than about 15.

4. The process of claim 1 wherein the initial hydrophobization step is achieved by using appropriate surfactants and collectors, including those that are normally used for flotation.

5. The process of claim 1 wherein the initial hydrophobization step is omitted when the particulate material is naturally hydrophobic, or has become moderately hydrophobic in an upstream process

6. The process of claim 1 wherein the initial hydrophobization step involves creating fresh surfaces by comminution and/or attrition, when the particulate material to be dewatered is coal or other naturally hydrophobic material.

7. The process of claim 1 wherein the initial hydrophobization step is employed when the surface of the particulate material to be dewatered has become less hydrophobic due to aging or superficial oxidation.

8. The process of claim 1 wherein the initial hydrophobization step renders the surface of the particulate material so that its water contact angle is considerably less than 90°.

9. The process of claim 1 wherein the particulate material includes minerals, coal, plastics, metals, metal powders, fly ash, biological materials, etc.

10. The process of claim 1 wherein the said mechanical means includes vacuum filtration, pressure filtration, centrifugal filtration, and centrifugation.

11. The process of claim 1 wherein the low HLB surfactant is selected from fatty acids, fatty esters, phosphate esters, hydrophobic polymers, ethers, glycol derivatives, sarcosine derivatives, silicon-based surfactants and polymers, sorbitan derivatives, sucrose and glucose esters and derivatives, lanolin-based derivatives, glycerol esters, ethoylated fatty esters, ethoxylated amines and amides, ethoxylated linear alcohols, ethoxylated tryglycerides, ethoylated vegetable oils, ethoxylated fatty acids, etc.

12. The process of claim **1** wherein a hydrophobicity-enhancing reagent disclosed in claim **11** is blended with a vegetable, fish or animal oil containing triacylglycerols to obtain synergistic improvement in dewatering fine particulate materials.

13. The process of claim **1** wherein the said appropriate solvents include light hydrocarbon oils and short-chain alcohols.

14. The process of claim **4** wherein the said appropriate surfactants are high HLB surfactants whose polar heads can interact with the surface of the particulate materials.

15. The process of claim **4** wherein the said collectors are thiols for sulfide minerals and metals.

16. The process of claim **4** wherein the said collectors are hydrocarbon oils when the particulate material is coal and other naturally hydrophobic substance.

17. The process of claim **5** wherein the said upstream processes include flotation, oil agglomeration, and/or conditioning with appropriate surfactants and collectors identified in claims **14**, **15**, and **16**.

18. A process for dewatering a slurry of fine particulate material, which comprises the steps of

    i) rendering the particulate material moderately hydrophobic using appropriate means,

    ii) adding an appropriate electrolyte or mixtures of electrolytes to the slurry,

    iii) adding a nonionic surfactant of low HLB number dissolved in an appropriate solvent or mixtures of solvents,

iv) agitating the slurry to allow for the surfactant molecules to adsorb on the surface of the moderately hydrophobic particulate material so that its hydrophobicity is substantially enhanced, and then

v) subjecting the conditioned slurry containing the particulate material, whose water contact angle has now been greatly increased, to a suitable mechanical method of dewatering,

so that the amount of the nonionic surfactant required to achieve a desired moisture of the particulate material is substantially reduced.

19. The process of claim **18** wherein the said appropriate electrolytes include salts of monovalent, divalent and trivalent cations and anions.

20. The process of claim **18** wherein the said electrolytes are the salts of aluminum ions.

21. The process of claim **18** wherein the reagents used in steps i, ii and iii can be added in a single step.

22. The process of claim **18** wherein the range of particle sizes is the same as for claim **1**.

23. The process of claim **18** wherein the constrains and conditions for the initial hydrophobizing step are the same as for claim **1**.

24. The process of claim **18** wherein the constraints and conditions for using the low HLB surfactants and appropriate solvents are the same as for claim **1**.

25. A process for dewatering a slurry of fine particulate material, which comprises the steps of

i) rendering the particulate material moderately hydrophobic using appropriate means,

ii) adding a nonionic surfactant of low HLB number dissolved in an appropriate solvent or mixtures of solvents,

iii) agitating the slurry to allow for the surfactant molecules to adsorb on the surface of the moderately hydrophobic particulate material so that its hydrophobicity is substantially enhanced, and then

iv) subjecting the conditioned slurry containing the particulate material, whose water contact angle has now been greatly increased, to an appropriate filtration process in which the filter cake is subjected to an appropriate vibratory means,

so that a higher degree of moisture reduction is achieved at a given cake thickness.

26. The process for claim **25** wherein the appropriate vibratory means include ultrasonic, mechanical and acoustic means.

27. The process of claim **25** wherein the range of particle sizes is the same as for claim **1**.

28. The process for claim **25** wherein the constraints and conditions for the initial hydrophobization step are the same as in claim **1**.

29. The process for claim **25** wherein the constraints and conditions for using the low HLB surfactants and appropriate solvents are the same as for claim **1**.

30. A process for dewatering a slurry of fine particulate material, which comprises the steps of

i) rendering the particulate material moderately hydrophobic using appropriate means,

ii) adding a nonionic surfactant of low HLB number dissolved in an appropriate solvent or mixtures of solvents,

iii) agitating the slurry to allow for the surfactant molecules to adsorb on the surface of the moderately hydrophobic particulate material that its hydrophobicity is substantially enhanced, and then

iv) subjecting the conditioned slurry containing the particulate material, whose water contact angle has now been greatly increased, to an appropriate filtration process in which a suitable surface tension lowering reagent is added to the filter cake in the form of fine mist or spray,

so that a higher degree of moisture reduction is achieved at a given cake thickness.

31. The process for claim **30** wherein the suitable surface tension lowering agent is selected from short-chain alcohols, light hydrocarbon oils, and surfactants.

32. The process of claim **30** wherein the range of particle sizes is the same as for claim **1**.

33. The process for claim **30** wherein the constraints and conditions for the initial hydrophobization step are the same as in claim **1**.

34. The process for claim **30** wherein the constraints and conditions for using the low HLB surfactants and appropriate solvents are the same as for claim **1**.

35. A process for dewatering a slurry of fine particulate material, which comprises the steps of

i) rendering the particles moderately hydrophobic using appropriate means,

ii) adding an appropriate electrolyte or mixtures of electrolytes to the slurry,

iii) adding a nonionic surfactant of low HLB number dissolved in an appropriate solvent or mixtures of solvents,

iv) agitating the slurry to allow for the surfactant molecules to adsorb on the surface of the moderately hydrophobic particulate material *via* hydrophobic attraction so that its hydrophobicity is substantially enhanced, and then

v) subjecting the conditioned slurry containing the particles, whose water contact angle(s) has (have) now been greatly increased, to an appropriate filtration process in which a suitable surface tension lowering reagent is added to the filter cake in the form of fine mist or spray and at the same time the filter cake is subjected to an appropriate vibratory means,

so that a substantial moisture reduction is achieved at high cake thicknesses using minimum amounts of reagents.

36. The process for claim **30** wherein the range of particle sizes is the same as for claim **1**.

37. The process for claim **30** wherein the constraints and conditions for the initial hydrophobization step are the same as in claim **1**.

38. The process for claim **30** wherein the constraints and conditions for using the low HLB surfactants and appropriate solvents are the same as for claim **1**.